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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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June 24, 1997

TO: Folder #2

THRU: Daron Haddock, Permit Supervisor

FROM: Robert Davidson, Soils Reclamation Specialist

RE: Culvert Expansion of Crandall Canyon Mine Surface Facility Area, Genwall Resources, Inc., Crandall Canyon, ACT/015/032-96-1, Folder #2, Emery County, Utah

## SYNOPSIS

Genwal Resources, Inc. have presented a Major Permit Modification to expand across Crandall Canyon Creek for the purpose of creating a larger surface facility area. The creek would be contained and diverted by installing a 1400 ft. long, 6 ft. diameter culvert. Utilizing imported fill material, construction of a new surface facility pad would add 5.98 acres to the existing 7.33 acres for a total of 12.78 acres within the disturbed area boundary.

## ENVIRONMENTAL RESOURCE INFORMATION
## SOILS RESOURCE INFORMATION

**Regulatory Reference: 30 CFR Sec. 783.21, 817.200(c); R645-301-220, -301-411.**

**Analysis:**

The Major Permit Modification adequately presents environmental resource information describing the soils within the surface facility expansion area as follows:

- There are no prime farmlands within the surface facility expansion area.
- Supplemental soil surveys present information which delineate the soils on a map, describe and identify the soils, evaluate present and potential soil productivity, and correlate the new soils information with past 3rd Order surveys.
- The supplemental soil survey falls between a 1st and 2nd Order soil survey.
- Salvaged subsoils have been chemically and physically analyzed to allow for use as substitute topsoil during reclamation.

**There are no prime farmlands within the surface facility expansion area.** Both the current surface facility area and the proposed culvert expansion area are located in Crandall Canyon, and as such, these areas are not conducive for agricultural purposes because of slope steepness, high soil rock content, and restrictive climate limitations. At the request of Genwal, the Soil Conservation Service conducted both prime farmland and alluvial valley floor investigations in 1981. Two separate letters of negative determination, dated respectively August 10, 1981 and November 23, 1981, were received from the SCS and are enclosed in Appendices 2-1 and 2-2.

**Supplemental soil surveys present information which delineate the soils on a soils map, describe and identify the soils, evaluate present and potential soil productivity, and correlate the new soils information with past 3rd Order surveys.** Supplemental soil surveys were conducted by Randy Gainer (formerly a Genwal Resources employee), Chris Hansen (Earthfax Engineering, Inc.), and David Steed (Environmental Industrial Service). Work was performed during 1995 and 1996 to assess the undisturbed soils within the area of the proposed culvert expansion project; appendix 2-3B contains the supplemental soil inventory while Appendix 3-2 discusses hydric soils within the Crandall Creek riparian area . Plate 2-4 illustrates the soils, soil boundaries and soil pit locations within the proposed culvert expansion area as referenced by Appendices 2-3B and 3-2.

Soils in Crandall Canyon were previously mapped (Order III) by the US Forest Service. North aspect soils on the south side of Crandall Creek are part of the Curecanti-Elwood-Duchesne Families Complex (map unit 107) and Bundo-Lucky Star-Adel Families Complex (map unit 711). In addition to these soil complexes, two small inclusions (map units A and B) of alluvial/colluvial soils were identified, described and mapped. These inclusions are soils that have been marked for salvage during construction of the culvert expansion project.

Map Unit A is located south of the warehouse on a terrace above the canyon floor and consists of a mix of colluvial and fluvial/alluvial deposits. Soil pit TP-3 was hand excavated to a 3.3' depth; soils consisted primarily of sandy loam to very stony loam with very weak soil structure.

Map Unit B is located in the bottom of the canyon and generally consists of poorly developed sandy loams of fluvial deposition by Crandall Creek. Soil pit TP-4 was also hand excavated to a depth of 4.5'. Soil horizons are the result of episodic deposition rather than in-place soil development. Soils here consist primarily of loam to sandy loam with little to no soil structure.

Soil pit TH-2 was hand excavated on the south face of Crandall Canyon directly across from the current load-out facility. This pit was located near the proposed disturbed area boundary which represents north aspect soils on the south face of Crandall Canyon. The soil generally consists of sandy loam to cobbly loam and included a 0.13' thick organic horizon. Soil depth was limited to 1.85' at this location where weathered bedrock was encountered.

Additional soil sampling adjacent to Crandall Creek was performed in August 1995 by EIS personnel. Soil samples were collected as part of a riparian vegetation study (Appendix 3-2) and consisted of two samples, Bench 1 and 2, obtained from the soil inclusion area Map Unit B, and six samples, SS-1 through SS-6 Riparian, collected adjacent to the creek. SS-1 Riparian was obtained at the top of the proposed culvert disturbance; SS-2 and SS-3 Riparian were collected in the central portion of the creek near the soil inclusion area Map Unit B; SS-4 through SS-6 Riparian were collected in lower sections of the disturbance area. Hand excavated pits were dug to a depth between 18 to 30 inches. Detailed soils logs are not available for these soil pits.

Soil horizons were sampled and analyzed for the parameters as required by the Divisions soil and overburden guidelines[1] for pits TH-2, TP-3 and TP-4. Composite samples were collected for Bench 1, 2 and SS-1 through SS-6. Analysis results are summarized in Appendix 2-3B, Table 8-1 through 8-4. Laboratory data sheets are included in Attachment A of this appendix. Based on the analyses results, the physical and chemical profile of the soils generally fall within the acceptable ranges as required by the Division's guidelines.

**The supplemental soil survey falls between a 1st and 2nd Order soil survey.** Soil characterizations in Appendix 2-3B for pits TP-3 and TP-4 meet the standards of the National Cooperative Soil Survey and the Soil Conservation Service.[2] Soil description for pit TH-2 is lacking in specificity and detail to meet the standards of the National Cooperative Soil Survey. No profile descriptions were given for Bench 1 & 2, and pits SS#1 through #6. Therefore, soil pits TP-3 and TP-4 may represent 5 acres using 1st Order survey requirements, and between 3 and 20 acres for a 2nd Order survey. The proposed culvert expansion project adds an additional 5.98 acres for a total surface facility acreage of 13.68.

The Division guidelines require a 1st Order soil survey with a minimum-size delineation of 1 hectare (2.5 acres) or less. A 2nd Order soil survey has a minimum-size delineation of 0.6 to 4 hectares (1.5 to 10 acres). First Order surveys are made for very intensive land uses requiring

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[1]Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, Leatherwood and Duce, 1988.

[2]Soil Survey Manual, USDA Handbook #18, October 1993.

very detailed and very precise knowledge and information about soils and their variability, generally in small areas. This type of information is necessary for mapping soils to the detail needed to project soil salvage and resulting volumes. Second Order surveys are made for intensive land uses that require precise knowledge and detailed information about soil resources and their variability.

**Salvaged subsoils have been chemically and physically analyzed to allow for use as substitute topsoil during reclamation.** Past soil salvage indicates that topsoil and subsoil were removed during the construction season of 1982. Actual procedures are not known, but MRP states that the subsoil and topsoil were not stockpiled separately. Therefore, the resulting soil mixture containing subsoils will be used as a substitute topsoil. In addition, soils to be salvaged within the proposed culvert expansion area will include subsoil mixed with topsoil.

Based on soil analysis results summarized in Appendix 2-3B, Table 8-1 through 8-4, the physical and chemical profile of the soils generally fall within the acceptable ranges as required by the Division's guidelines.

**Findings:**

The requirements of this section of the regulations are considered adequate.

## OPERATION PLAN
## TOPSOIL AND SUBSOIL

**Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.**

**Analysis:**

The Operation Plan sufficiently presents procedures for safeguarding the soil resources during construction and operation phases of the culvert-expansion project. Soil salvage and stockpiling operations are adequatly described as follows:

- Approximately 3500 cubic yards of soil will be selectively salvaged from the proposed expansion disturbance area. A soil scientist will be available to insure that optimal soil salvage of the best available material occurs.
- To preserve the natural undisturbed soils associated with the stream channel and the steep slope area on the southern flank of the stream, soils will not be salvaged but buried and protected under a geotextile fabric and marker layer prior to placing any

backfill during construction.

- Subsoils salvaged within the proposed culvert expansion area will be used as substitute topsoil.
- Five years prior to reclamation, Genwal will consult with the Division and form a task force for re-evaluating and optimizing the proposed reclamation techniques and practices.
- Topsoil and substitute topsoil salvaged from the expansion area will be stored in Stockpile #3.

**Approximately 3500 cubic yards of soil will be selectively salvaged from the proposed expansion disturbance area. A soil scientist will be available to insure that optimal soil salvage of the best available material occurs.** A projected 1084 cubic yards of topsoil and subsoil will be salvaged from Map Unit A, north slope area down from the warehouse, 0.11 acres. 1860 cubic yards of soil will be salvaged from Map Unit B, south slope bench area across the creek, 0.23 acres. An additional 536 cubic yards of soil will be salvaged from a 0.25 acre location identified as Map Unit C, the permanent Coal Pile area, adjacent slope where the southern flank of the coal pile will rest against the existing hillside. In addition, soil will be salvaged within the sediment pond and temporary road area. Figure 8B illustrates the three map units identified for soil salvage.

All topsoil salvage activities will occur under the direction of a soils scientist to assure optimum recovery of the soil resources and that the best available material is salvaged.

**To preserve the natural undisturbed soils associated with the stream channel and the steep slope area on the southern flank of the stream, soils will not be salvaged but buried and protected under a geotextile fabric and marker layer prior to placing any backfill during construction.** Within the 1.10 acres associated with the stream, streambank and the 1.53 acres of steep slope area on the southern flank of the stream, no topsoil will be salvaged to help preserve the alluvial and residual soil structure and native characteristics. The native soils in these two areas will be left undisturbed and covered with a geotextile fabric prior to placing any backfill during construction.

Prior to placing the geotextile fabric, all trees and brush will first be removed from along the sides of the stream channel and hillside. Trees will be cut approximately 3" to 5" above the ground with the roots left intact to help hold the soils in-place.

The purpose of the geotextile is to protect the existing stream and hillside soils in their in-place condition, and to provide a protective barrier between the topsoil and the imported fill material. A marker material consisting of a fill material of a different color will be placed

between the geotextile fabric and the fill. This marker layer will serve as a visual aid to assist reclamation efforts in the future when the fill is being removed.

**Subsoils salvaged within the proposed culvert expansion area will be used as substitute topsoil.** Within the proposed culvert expansion area, subsoil and topsoil will not be removed nor stockpiled separately. Therefore, the subsoil will be used with the topsoil during reclamation. Based on soil analyses results summarized in Appendix 2-3B, Table 8-1 through 8-4, the physical and chemical profile of both the topsoil and subsoil fall within the acceptable ranges as required by the Division's guidelines.

**Five years prior to reclamation, Genwal will consult with the Division and form a task force for re-evaluating and optimizing the proposed reclamation techniques and practices.** Five years prior to beginning reclamation operations, Genwal will consult with the Division to re-evaluate the reclamation techniques and practices associated with handling the topsoil as proposed in the reclamation plan. This consultation will include forming a task force of members with various suitable reclamation expertise to review the plan and recommend the best and most suitable reclamation practices. The review and consultation will re-assess and revise, where needed, the existing reclamation plan.

**Topsoil and substitute topsoil salvaged from the expansion area will be stored in Stockpile #3.** The existing soil stockpile #3 is being proposed to store the topsoil and substitute topsoil salvaged from the culvert expansion project. After the soil has been placed on the stockpile, 2 tons per acre of organic mulch and an approved seed mix will be applied as approved by the Division. The mulch and seed will be applied to the topsoil stockpile in the early fall

**Findings:**

The requirements of this section of the regulations are considered adequate.

## RECLAMATION PLAN
## TOPSOIL AND SUBSOIL

**Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.**

**Analysis:**

The permit application includes plans for soil redistribution, use of soil nutrients and amendments, and stabilization of reclaimed soils as follows:

- Soil redistribution will replace an average 12 to 16 inches of soil to selected portions of the Original Surface Facility and Surface Expansion areas, for a total soil replacement volume of 9,230 cubic yards.
- Special reclamation techniques will be used that revitalize and stabilize the existing soils left-in-place and to restore the previous channel morphology; no additional topsoil will be redistributed in these areas.
- Soil nutrients and amendments will be applied to the soils after soil redistribution and during final reclamation.
- Standard soil stabilization practices should include surface roughening techniques, such as gouging and/or deep pocking, to help minimize compaction.

**Soil redistribution will replace an average 12 to 16 inches of soil to selected portions of the Original Surface Facility and Surface Expansion areas, for a total soil replacement volume of 9,230 cubic yards.** Soil redistribution volumes are presented in a table on Page 2-8 and in Figure 8C. In review, the Original Surface Facility Area, 4.50 acres, will receive 12" of soil for a total of 7,260 cubic yards; and the Expansion Area, 0.98 acres, will receive 16" on the north and south slope bench areas and 12" on the coal pile area for a total of 1,970 cubic yards of soil. Areas that will not receive topsoil total 8.20 acres.

**Special reclamation techniques will be used that revitalize and stabilize the existing left-in-place soils and restore the previous channel morphology within the steep, south slopes and Crandall Creek areas associated with the culvert expansion; no additional topsoil will be redistributed on these areas.** Reclamation procedures for the culvert expansion area are discussed on pages 2-9 through 2-10, page 2-12, and in Appendix 5-22. In the south slope and stream bottom areas where the topsoil was left in-place and protected by the geotextile fabric, these areas will not receive any additional soil during final reclamation. Topsoil recovered from these areas will instead be used to reclaim the original surface facility area.

Fill material will be removed in 5-10 foot lifts, thus exposing the marker layer and geotextile fabric in incremental steps. Reclaiming the south slope in 5-10 foot vertical increments, as the yard is being removed, will allow better access to the slope for hand work such as seeding, raking and mulching and also minimize soil disturbance and exposure to erosion.

The marker layer will be carefully removed and the exposed geotextile fabric will be peeled away from the surface of the slope. The soil will then be sampled and tested for physical and chemical characteristics to determine what amendments might be needed. The steep, south slope will treated with PAM (polyacrylamide), a soil treatment to enhance moisture retention and relieve compaction. After fertilization, the seed will be broadcast and hand raked into the soil surface. A soil inoculum will also be incorporated to aid the re-establishment of soil bacteria,

mycorrhizal fungi and mycelium. Wood fiber mulch will then be sprayed over the slope and then a bonded fiber matrix tackifier will be applied.

**Soil nutrients and amendments will be applied to the soils after soil redistribution and during final reclamation.** Two soil samples per acre will be submitted to a lab for assessment of nutrient requirements. All lab work will be conducted by a Division approved and qualified laboratory. Results of the samples, along with consultation with the Division, will determine the necessary nutrients and amendments to the soil.

**Standard soil stabilization practices should include surface roughening techniques, such as gouging and/or deep pocking, to help minimize compaction.** In those areas to receive topsoil, the surface will be regraded and ripped to help ensure positive contact and minimize slippage between the freshly prepared surface and the redistributed topsoil. Regraded areas with slopes less than 20% will be disced while slopes greater than 20% will be scarified using a trackhoe. Topsoil will be protected from wind and water erosion before and after reseeding. Genwal proposes to disc and harrow the soil after redistribution to minimize compaction. *However, such traditional agricultural-type methods on steep slopes will not only prove difficult, but are not likely to be highly successful for providing a stable surface for plant establishment. The Division recommends also using surface roughening techniques, such as gouging and/or deep pocking, to minimize compaction. These techniques have also proven noteworthy for controlling surface runoff and erosion, helping harvest water, and providing micro-conditions that promote plant establishment.*

**Findings:**

The requirements of this section of the regulations are considered adequate.